

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 08-258369

(43)Date of publication of application : 08.10.1996

(51)Int.CI.

B41J 25/34
B41J 2/01

(21)Application number : 07-088881

(71)Applicant : SEIKO EPSON CORP

(22)Date of filing : 22.03.1995

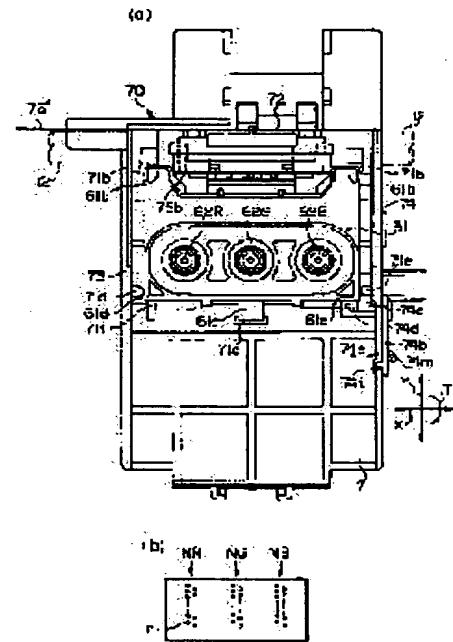
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(54) INK JET PRINTER

(57)Abstract:

PURPOSE: To facilitate the position regulation of a head in an ink jet printer by providing an energizing member for energizing an ink jet toward an eccentric cam in contact with the jet at a carriage.

CONSTITUTION: A rib 71f is formed substantially at the center of the right side of the upper surface of the bottom plate 71 of a carriage 70, and its back surface is brought into contact with the front face of the left corner 61d of a nozzle 61. A regulating lever 74b is provided rotatably by a shaft 74c at the right side plate 74 of the carriage 70, an eccentric cam 74d is formed at the shaft 74c, and the cam 74d is brought into contact with the front face of the right corner 61e of the nozzle 61. When a head is mounted at the carriage 70, the head is energized in a direction in the drawing by the compression spring. Accordingly, it is positioned in the longitudinal direction (the direction of an arrow Y). When the lever 74b is rotated, the nozzle 61 is rotated in the direction of an arrow T by the operation of the cam 74d, and hence the parallelism to the shaft 12 can be easily regulated.



LEGAL STATUS

[Date of request for examination] 08.12.2000

[Date of sending the examiner's decision of rejection] 25.12.2001

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection] 2002-01145

[Date of requesting appeal against examiner's decision] 22.01.2002

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CLAIMS

[Claim(s)]

[Claim 1] The ink jet printer equipped with the guide shaft which is characterized by providing the following and which is extended in the conveyance direction of a form, and the direction which intersects perpendicularly, the carriage which is guided at this guide shaft and reciprocates, and the ink-jet head which is carried in this carriage, and breathes out and prints ink from a nozzle in the aforementioned form. The eccentric cam which is prepared in the aforementioned carriage possible [rotation] and contacts the aforementioned ink-jet head. the energization which is prepared in the aforementioned carriage and energizes the aforementioned ink-jet head towards the aforementioned eccentric cam -- a member

[Claim 2] The aforementioned ink-jet head is an ink jet printer according to claim 1 characterized by having two or more nozzle trains in the move direction of the aforementioned carriage.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] Especially this invention relates to the structure of carriage where the ink-jet head (only henceforth a head) was carried, about an ink jet printer. It is related with the adjustment technique of the attaching position of a head to carriage in more detail.

[0002]

[Description of the Prior Art] Generally an ink jet printer is carried in the guide shaft 1101 extended in the conveyance direction Y of Form P, and the direction which intersects perpendicularly as shown in drawing 8, the carriage 1102 which is guided at this guide shaft 1101 and reciprocates to an arrow X1 and X 2-way, and this carriage 1102, and it has the ink-jet head 1103 which breathes out and prints ink in Form P. Many nozzles n are carrying out opening to opposed face 1103a with the form of a head 1103, ink is alternatively breathed out from these nozzles and predetermined printing is made.

[0003] Therefore, in such an ink jet printer, in order to aim at improvement in a quality of printed character, the precision (the inclination to the guide shaft 1101 should mainly be set to 0) of the attaching position to the carriage 1102 of a head 1103 is important.

[0004] If the precision of the attaching position to carriage 1102 is bad to attain high resolution-ization of a printing picture especially when the nozzle trains N1, N2, and N3 of plurality (drawing three trains) are formed in a head 1103 in the move direction of carriage 1102 as shown in drawing 9, degradation of a quality of printed character will become large. That is, if a head is attached in the state where it inclined to the arrow T1 or T 2-way, compared with the nozzle train N2 located in the center, the amount of gaps to the direction of Y of the nozzle trains N1 and N3 of both sides will become large, and degradation of a quality of printed character will become large.

[0005] Then, conventionally, as shown in drawing 8 (a), the positioning sections 1104 and 1105 are formed in carriage 1102. A head 1103 is energized according to the force F of a spring etc. towards these positioning section. The attaching position of a head was adjusted by making a spacer 1106 intervene between one positioning section 1105 and a head 1103, preparing some kinds of things from which thickness differs as this spacer 1106, and making the spacer 1106 of suitable thickness intervene.

[0006]

[Problem(s) to be Solved by the Invention] in the Prior art mentioned above, since two or more sorts of spacers 1106 with which thickness differs needed to be prepared, there was a problem that the preparation was complicated and the exchange work it is [work] a spacer for positioning of a head was also complicated

[0007] The purpose of this invention solves the above troubles and is to offer the ink jet printer which can perform positioning of a head easily.

[0008]

[Means for Solving the Problem] In order to attain the above-mentioned purpose an ink jet printer according to claim 1 The guide shaft extended in the conveyance direction of a form, and the direction which intersects perpendicularly, and the carriage which is guided at this guide shaft and reciprocates, In the ink jet printer equipped with the ink-jet head which is carried in this carriage, and breathes out and prints ink from a nozzle in the aforementioned form It is prepared in the aforementioned carriage possible [rotation], is prepared in the eccentric cam which contacts the aforementioned ink-jet head, and the aforementioned carriage, and is characterized by having the energization member which energizes the aforementioned ink-jet head towards the aforementioned eccentric cam.

[0009] An ink jet printer according to claim 2 is characterized by the aforementioned ink-jet head having two or more nozzle trains in the move direction of the aforementioned carriage in an ink jet printer according to claim 1.

[0010]

[Function] According to the ink jet printer according to claim 1, carriage is guided at a guide shaft, and reciprocates, ink is breathed out from an ink-jet head, and printing is made by the form.

[0011] Since carriage is equipped with the eccentric cam which contacts an ink-jet head and which can be rotated, and the energization member which energizes an ink-jet head towards this eccentric cam, it can perform positioning of a head easily by rotating an eccentric cam.

[0012] And since it is adjustment by making a head contact an eccentric cam, compared with adjustment by exchange of the conventional spacer, it can tune finely.

[0013] According to the ink jet printer according to claim 2, in an ink jet printer according to claim 1, since the aforementioned ink-jet head has two or more nozzle trains in the move direction of the aforementioned carriage, printing of high resolution is obtained more.

[0014] If the precision of the attaching position to carriage is bad when the ink-jet head has two or more nozzle trains in the move direction of carriage, although degradation of a quality of printed character will become large, since it can tune finely easily according to this printer according to claim 2, good moreover, printing of high resolution is obtained more easily.

[0015]

[Example] Hereafter, one example of this invention is explained with reference to a drawing.

[0016] Drawing 1 is the sectional side elevation showing the internal structure of one example of the ink jet printer concerning this invention.

[0017] First, the outline of this printer is explained.

[0018] In drawing 1, 10 is automatic feeding equipment with which the main part of a printer and 11 are included in the case of a main part, and 20 is included in the main part 10.

[0019] A main part 10 meets the paper path PP which the form (not shown) with which it was fed by automatic feeding equipment 20 passes. The ejection roller 30, the pinch roller 40 which carries out a pressure welding to this ejection roller 30, and follows, and the convention which it shows to the rear face of a form -- with a member 50 the carriage 70 with which the ink-jet head 60 which breathes out and prints an ink drop towards a form was carried, a guide idler 80, and a delivery roller pair -- it has 81, 82, and the discharge section 90. Moreover, the delivery tray 91 for carrying out the laminating of the discharged form is formed in the front face of a main part 10.

[0020] The form (not shown) with which it was fed by automatic feeding equipment 20 reaches the ejection roller 30 through the paper path PP which curved to the concave as a whole in drawing 1, and the delivery angle is specified and it is sent out by the pinch roller 40 from the ejection roller 30. the convention whose nose of cam of the, as for the sent-out form, also plays a role of a guide member first -- by showing around by the member 50, an interval with the ink-jet head 60 is specified, and ink is breathed out and printed from a head 60 on the front face A is a printing area. the printed form -- a delivery roller pair -- pass 81, 82, and the discharge section 90 -- it is discharged on the delivery tray 91

[0021] Next, the detail of a head 60 and carriage 70 is explained.

[0022] Similarly the partial abbreviation plan [front view / partial cutting / of carriage] of the carriage with which drawing 2 was carried and, as for drawing 3 (a), the head was carried, and drawing 4 are partial abbreviation sectional side elevations (IV-IV cross section in drawing 2).

[0023] Carriage 70 is equipped with a bottom plate 71, the background 72, and the side plates 73 and 74 on either side as shown in these drawings. The bearing holes 73a and 74a are established in the side plates 73 and 74 on either side, and the guide shaft 12 is inserted in these bearing holes 73a and 74a (refer to drawing 1). As shown in drawing 4, front end section (it sets to drawing 4 and is the left end section) 71a of a bottom plate 71 is supported by the guide plate 13. The guide shaft 12 and the guide plate 13 are constructed over the side frame (not shown) of a main part 10. Engagement section 72a with a timing belt (not shown) is prepared in the background 72, and when a timing belt drives by the carriage motor (not shown), carriage 70 is guided by the guide shaft 12 and the guide plate 13, and reciprocates in drawing 2 to an arrow X1 and X 2-way (direction which intersects perpendicularly with the space of drawing 1).

[0024] the dead air space S where carriage 70 adjoins the both sides of the guide shaft 12 and the ink-jet head 60 as shown in drawing 4 -- having -- **** -- this dead air space S -- a pressure welding -- the energization which serves as a member 75 and the 1st electrical installation section 76 from a compression spring -- the member 77 is contained

[0025] a pressure welding -- a member 75 is for preventing with [of the guide shaft 12 and carriage 70] backlash, and the 1st electrical installation section 76 is for performing electrical installation with a head 60

[0026] a pressure welding -- a member 75 is shown also in drawing 5 -- as -- energization -- it has receptacle section 75a which receives a member 77, and the slide contact sections 75b and 75b which *** on the guide shaft 12

[0027] Receptacle section 75a is mostly formed in plate-like. The slide contact sections 75b and 75b are formed in the

shape of [which curves and hangs from the soffit both sides of receptacle section 75a] a presser foot stitch tongue. The inside of this ***** on the guide shaft 12. Salient 75c is formed in the center of a back upper limit of receptacle section 75a, and as this salient 75c shows drawing 4, it fits in each other gently with hole 72c formed in the background 72. therefore, a pressure welding -- a member 75 is a rotatable in any direction of the direction of arrow a shown in drawing 5 focusing on salient 75c, the direction of b, and the direction of c 75d and 75d are hooks for [tacking] which engage with the rubber-slab electrode holder 79 mentioned later.

[0028] The 1st electrical installation section 76 is constituted by the edge of FPC(Flexible Printed Cable)76'.

[0029] 78 is a rubber slab and 79 is a rubber-slab electrode holder.

[0030] As shown also in drawing 6, the rubber-slab electrode holder 79 is mostly formed in the tabular, and has rubber-slab fixed part 79a by which a rubber slab 78 is fixed to the center section by adhesion etc. Insertion slit 79b in which FPC76' is inserted is formed in the upper part of rubber-slab fixed part 79a, and engagement slit 79c by which engagement fixation of the point 76a (refer to drawing 4) of FPC76' is carried out is formed in the lower part.

Moreover, salient 79e which attends 79d of angle hole and 79d of this angle hole, respectively is prepared in right-and-left both sides. the pressure welding mentioned above in 79d of this angle hole -- hook 75d of a member 75 inserts in -- having -- this and salient 79e -- being engaged -- the rubber-slab electrode holder 79 and a pressure welding -- it is tacking carried out of the member 75

[0031] 79f of long rectangle holes is somewhat formed in right and left, and 79g (it is called x hole) of holes of the "x" form for positioning is formed in the lower part for positioning which is 79d of angle holes of the method of the right at the lower part of 79d of left angle holes. As shown in drawing 2 and drawing 4, the prisms 72f and 72g which protruded towards the front from the background 72 are inserted in the holes 79f and 79g for these positioning, respectively. While positioning of the vertical direction is made by engagement to 79f of rectangle holes, and 72f of prisms and positioning of the direction of four directions is made by engagement to 79g of x holes, and 72g of prisms, the rubber-slab electrode holder 79 is guided at these prisms 72f and 72g, and is movable to a cross direction (it sets to drawing 4 and is a longitudinal direction).

[0032] Side plates 79h and 79h are formed in the both-sides section of the rubber-slab electrode holder 79, and a total of four of two pin 79i are prepared in 79h of this side plate up and down, respectively. Behind the rubber-slab electrode holder 79, the lever mechanism for head fixation mentioned later is interlocked with, the plate cam 160 moving up and down is arranged, and the aforementioned pin 79i is in contact with the cam side (not shown). By this, vertical movement of a plate cam 160, i.e., the operation of a lever mechanism and the longitudinal slide movement of a rubber-slab electrode holder, is interlocking.

[0033] FPC76' constitutes the 1st electrical installation section 76 in the front face of a rubber slab 78 by the point 76a's passing along insertion slit 79b of the rubber-slab electrode holder 79, passing through the front face of the rubber putt 78, and fixing it to engagement slit 79c. Two or more points for connection are formed in the front face of the electrical installation section 76, and two or more salient 78a is formed in the rubber slab corresponding to these points. In addition, the other end of FPC76' is connected to the control section 14 (refer to drawing 1) of a main part 10.

[0034] As shown in drawing 4, the ink-jet head 60 has the nozzle section 61 and the case section 62.

[0035] The head 60 of illustration is a head for full color printing, and as shown in drawing 3 (b), the nozzle train NR of red ink *****, the nozzle train NG of yellow ink *****, and the nozzle train NB of blue ink ***** are formed in the undersurface of the nozzle section 61, i.e., opposed face (nozzle side) 61 with form a. Each nozzle train consists of nozzle train 2 trains (a total of 20 nozzles) which consist of ten nozzles n, and a total of 60 nozzles are prepared in the whole nozzle side 61a.

[0036] An ink cartridge 63 is contained by the case section 62. The lever which is not illustrated for fixing an ink cartridge 63 is prepared in the case section 62. The ink cartridge 63 is divided into three ink rooms, and red ink, green ink, and blue ink are contained by each ink room.

[0037] Three needles (62R, 62G, 62B) which have passage are formed in bottom plate 62a of the case section 62. If the case section 62 is equipped with an ink cartridge 63, each needles 62R, 62G, and 62B will advance into the ink room of an ink cartridge 63, respectively, and the ink of each color will be supplied to each nozzle train NR, NG, and NB through the passage.

[0038] The driver element corresponding to each nozzle is built in the nozzle section 61, an ink drop is breathed out by the alternative operation of these elements from a nozzle, and a picture is formed on a form of it.

[0039] The 2nd electrical installation section 64 is formed in the tooth back of the case section 62. This connection 64 consists of substrates and the connection which a pressure welding is carried out to the point for connection of the 1st electrical installation section 76 mentioned above, and is connected is formed in the front face of a substrate 64. The substrate 64 is connected to the aforementioned driver element through FPC65.

[0040] Positioning at the time of equipping carriage 70 with a head 60 and positioning are made as follows.

[0041] Since the position precision of a nozzle is important in an ink jet printer, the nozzle section 61 performs positioning and positioning. The nozzle section 61 serves as another parts in the case section 62, and the dimensional control is strictly made rather than the case section 62.

[0042] In order to give explanation about positioning and positioning intelligible in drawing 3 (a), the case section 62 is omitted.

[0043] As shown in this drawing, the protruding pieces 61b and 61b extended horizontally are formed in the back ends of the nozzle section 61, and the undersurface of this protruding piece 61b contacts the upper surface of rib 71b formed in the bottom plate 71 of carriage 70 (refer to drawing 4). Moreover, protruding piece 61c extended horizontally is formed in the center of the front part of the nozzle section 61, and the undersurface of this protruding piece 61c contacts the upper surface of rib 71c formed in the bottom plate 71 of carriage 70. Positioning of the vertical direction (direction which intersects perpendicularly with the space of drawing 3) is made by this.

[0044] Two ribs 71d and 71e which carry out phase opposite are formed in the upper surface right-and-left simultaneously center section of the bottom plate 71 of carriage 70, and the inside side of these ribs contacts the side of 61d of left corners of the nozzle section 61, and right corner 61e, respectively. Positioning of a longitudinal direction (the direction of arrow X) is made by this.

[0045] Rib 71f is formed in the upper surface left simultaneously center section of the bottom plate 71 of carriage 70, and the tooth back which is this rib 71f contacts the front face which is 61d of left corners of the nozzle section 61.

[0046] Moreover, adjusting-lever 74b is prepared in the right-hand side board 74 of carriage 70 by the shaft 74c possible [rotation]. 74d of eccentric cams is formed in shaft 74c, and 74d of this eccentric cam contacts the front face of right corner 61e of the nozzle section 61.

[0047] If carriage 70 is equipped with a head 60, a head 60 will be energized ahead (it sets to drawing 3 and is a lower part) by the compression spring 77 mentioned above so that it may mention later. Therefore, positioning of a cross direction (the direction of arrow Y) is made. Moreover, if adjusting-lever 74b is rotated, since the nozzle section 61 will rotate in the direction of arrow T in an operation of 74d of eccentric cams, the parallelism to the guide shaft 12 can be adjusted easily.

[0048] Rotation operation of adjusting-lever 74b is made at works etc., and is not usually operated for some users. As shown also in drawing 7 , 74g of flexible pieces is formed in adjusting-lever 74b, and pin 74e is prepared at the nose of cam. 74f of two or more holes which engage and release this pin 74e is established in the right-hand side board 74 of carriage. Hook 74h of an omission stop is prepared near the shaft 74c of an adjusting lever, and engagement presser-foot-stitch-tongue 74i is prepared in the upper limit. Engaging with this hook 74h possible [movement of the inside of circular slit 74j formed in the right-hand side board], engagement presser-foot-stitch-tongue 74i is engaging with this possible [movement of the inside of circular slit 74k]. Moreover, ring 74m for operation is formed at the nose of cam of the 74g of the aforementioned flexible pieces.

[0049] Rotation operation of adjusting-lever 74b puts a needlelike operation implement into ring 74m, sags 74g of flexible pieces clockwise in drawing 7 (b), and is performed by removing pin 74e from 74f of holes. After carrying out rotation operation and performing parallelism adjustment, 74f of holes is made to engage with pin 74e. Thereby, unprepared rotation of lever 74b is prevented.

[0050] In addition, head 60' for monochrome printing besides the head 60 for full car printing mentioned above (refer to drawing 1) can also equip with the printer of this example as a head. Head 60' for monochrome printing completely has the same shape of a head 60 and an appearance for full car printing. Different points are only the number of nozzles, and numbers, such as a needle which introduces the portion corresponding to this, i.e., a driver element, and ink. For example, the train of four trains and 1 train 10 nozzle uses [the train of 1 train 11 nozzle] the number of nozzles as a total of 64 nozzles in two trains, and let a needle be one needle which is open for free passage for these nozzles.

[0051] In drawing 4 , 100 is a lever mechanism for head fixation.

[0052] The lever mechanism 100 is equipped with the 1st and the 2nd link 130,140 which have connected the control lever 110, the head press lever 120, and these control levers 110 and the head press lever 120, and two springs 150 (refer to drawing 2).

[0053] The control lever 110 is attached in carriage 70 possible [rotation] with the shaft 111. The knob 112 is formed at the nose of cam of a control lever 110, and the hook 113 is formed in the soffit.

[0054] The head press lever 120 is attached in carriage 70 possible [rotation] with the shaft 121. The heights 122 which press a head 60 are formed at the nose of cam of the head press lever 120, and the plate cam 160 mentioned above is connected in the connection section 123 between this heights 122 and shaft 121. Moreover, the engagement section 124 with a spring 150 is formed in the back end of the head press lever 120.

[0055] As for the 1st link 130 and the 2nd link 140, both end is connected possible [rotation] in the connection section 131 (141). The other end 132 of the 1st link 130 is connected with the control lever 110 possible [rotation] by the pin 133, and the other end 142 of the 2nd link 140 is connected with the shaft 121 of the head press lever 120 possible [rotation] by hook 143. The engagement section 144 with a spring 150 is formed at the nose of cam of the 2nd link 140.

[0056] The spring 150 is stretched between the engagement section 124 of the head press lever 120, and the engagement section 144 of the 2nd link 140.

[0057] Drawing 4 shows the state where it equipped with the head 60.

[0058] In this state, the heights 122 of the head press lever 120 contact upper surface 62b of the case section 62 of a head 60, and where a head is pressed below according to the energization force of a spring 150, they are fixing the head 60 to carriage 70. This state is locked when the hook 113 of a control lever 110 is engaged at the nose of cam 134 of the 1st link 130. Moreover, in this state, it is in the state where the plate cam 160 lower-***(ed), and the regulation to the rubber-slab electrode holder 79 is canceled. Therefore, the rubber-slab electrode holder 79 is carrying out the pressure welding of the 1st electrical installation section 76 to the 2nd electrical installation section 64 of a head 60 through the rubber slab 78 by operation of a compression spring 77. Moreover, the pressure welding of the nozzle section 61 of a head is carried out to rib 71f and 74d of eccentric cams mentioned above by operation of a compression spring 77, and positioning is made. on the other hand -- reverse -- a pressure welding -- the member 75 was counterclockwise energized by the compression spring 77 in drawing 4 focusing on salient 75c, and the slide contact sections 75b and 75b are in contact with the guide shaft 12 with this

[0059] In order to remove a head 60, in drawing 4 , rotation operation of the knob 112 of a control lever 110 is carried out clockwise. Then, a knob 112 rotates relatively to a control lever 110 by the elastic deformation of itself, by this, hook 113 separates from it from the nose of cam 134 of the 1st link 130, and a control lever 110 rotates it. This can be interlocked with, the press lever 120 can also be rotated, and a head 60 can be removed. When the press lever 120 rotates, a plate cam 160 is upper-***(ed), the rubber-slab electrode holder 79 resists the energization force of a compression spring 77 by this, and it retreats to the method of the right in drawing 4 . Therefore, in case a head 60 is removed, the 1st electrical installation section 76 by the side of carriage, the 2nd electrical installation section 64 by the side of a head 60, and a pressure-welding state are canceled. Thereby, in case a head 60 is removed, the situation where the 1st electrical installation section 76 and the 2nd electrical installation section 64 will be ground strongly, and these electrical installation section will be damaged is prevented.

[0060] According to the above ink jet printers, the following operation effects are acquired.

[0061] (i) Carriage 70 is guided at the guide shaft 12, and reciprocates, ink is breathed out from the ink-jet head 60, and printing is made by the form.

[0062] the energization which energizes the ink-jet head 60 towards 74d of eccentric cam to which carriage 70 contacts the ink-jet head 60, and which can be rotated, and 74d of this eccentric cam -- since it has the member 77, positioning of a head 60 can be easily performed by rotating 74d of eccentric cams

[0063] And since it is adjustment by making a head 60 contact an eccentric cam, compared with adjustment by exchange of the conventional spacer, it can tune finely.

[0064] (ii) Since the head 60 has two or more nozzle trains in the move direction of carriage 70, printing of high resolution is obtained more.

[0065] If the precision of the attaching position to carriage is bad when the head 60 has two or more nozzle trains in the move direction of carriage, although degradation of a quality of printed character will become large, since it can tune finely easily according to this printer, good moreover, printing of high resolution is obtained more easily.

[0066] (iii) between the guide shaft 12 and carriage 70 -- energization -- since the contact pressure is given by the member 77, the backlash of carriage 70 and the guide shaft 12 is prevented, and an operation of the above (ii) and a conjointly more good quality of printed character are obtained

[0067] Moreover, since the electrical installation of carriage 70 and the ink-jet head 60 is made by the pressure welding of the 1st electrical installation section 76 prepared in carriage 70, and the 2nd electrical installation section 64 prepared in the ink-jet head 60, the ink-jet head 60 is removable to carriage 70.

[0068] and the energization member which gives a contact pressure between the electrical installation section 76 of these 1st, and the 2nd electrical installation section 64 and the energization member which gives a contact pressure between the guide shaft 12 and carriage 70 -- the energization for the aforementioned positioning -- since it is used by the member 77 in common -- the part energization -- there are few members and it ends

[0069] Therefore, according to this ink jet printer, by few part mark, while being able to lose the backlash of carriage 70 and the guide shaft 12, a head 60 can be made removable to carriage 70, and electrical installation of a head 60 and carriage 70 can be performed certainly, and the good picture of high resolution can be acquired easily.

[0070] (iv) -- the dead air space S where carriage 70 adjoins the both sides of the guide shaft 12 and the ink-jet head 60 -- having -- **** -- this dead air space S -- energization -- since the member 77 is contained, the miniaturization of carriage is attained

[0071] As mentioned above, although one example of this invention was explained, this invention is not limited to the above-mentioned example, and deformation implementation is possible for it suitably within the limits of the summary of this invention.

[0072]

[Effect of the Invention] According to this invention, positioning of a head can be performed easily.

[0073]

[Translation done.]

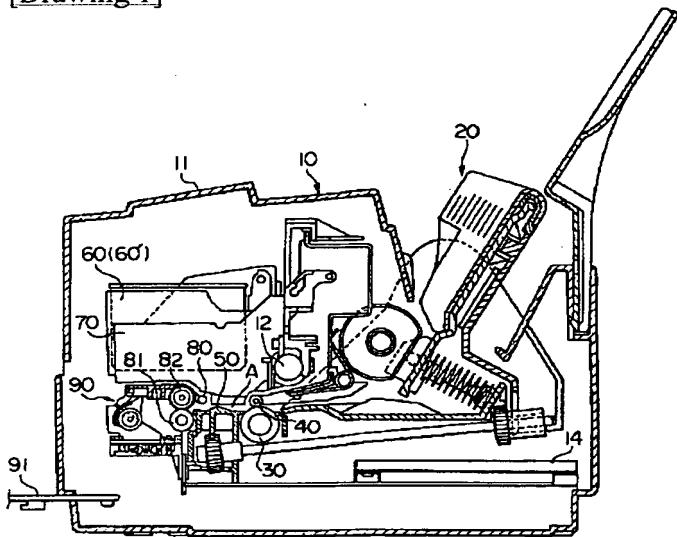
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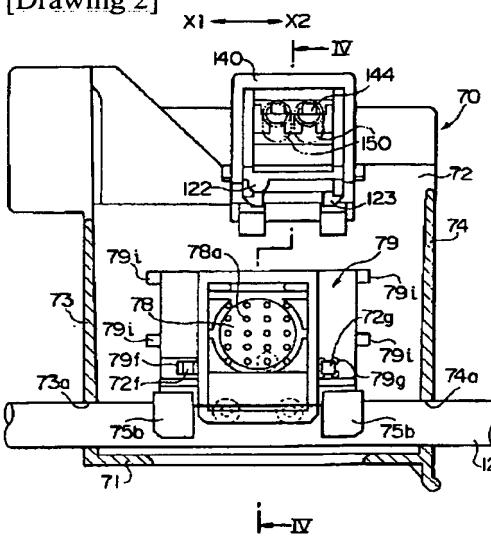
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DRAWINGS

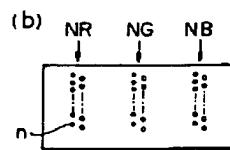
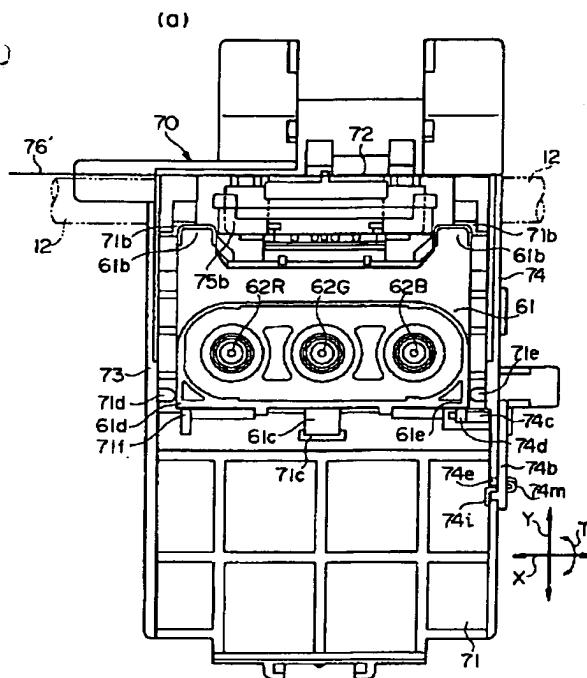
[Drawing 1]



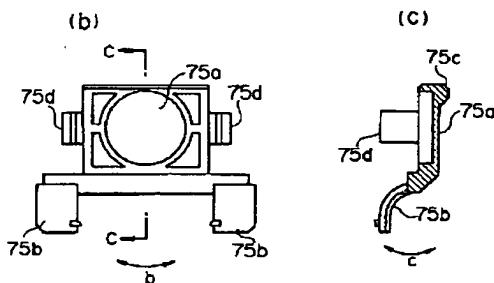
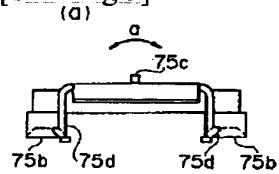
[Drawing 2]



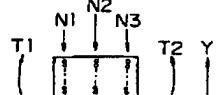
[Drawing 3]



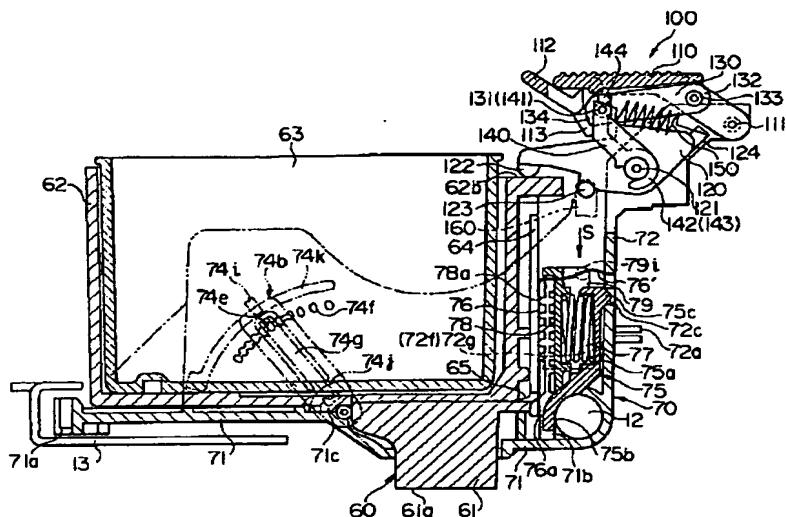
[Drawing 5]



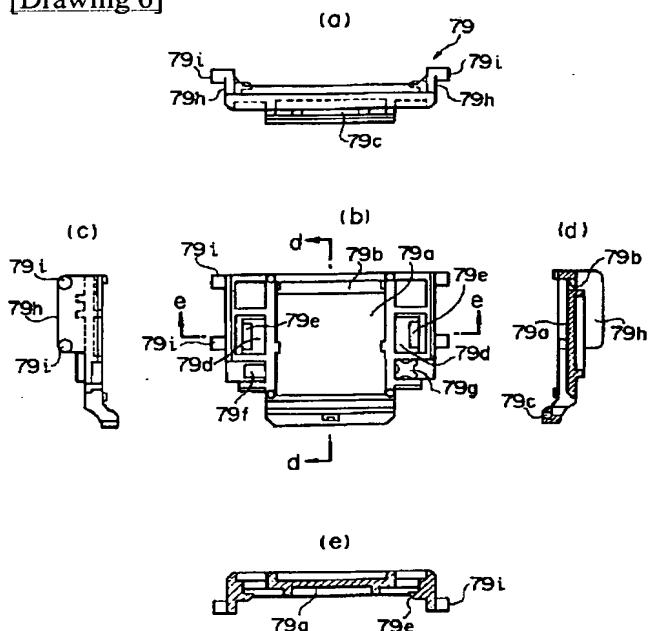
[Drawing 9]



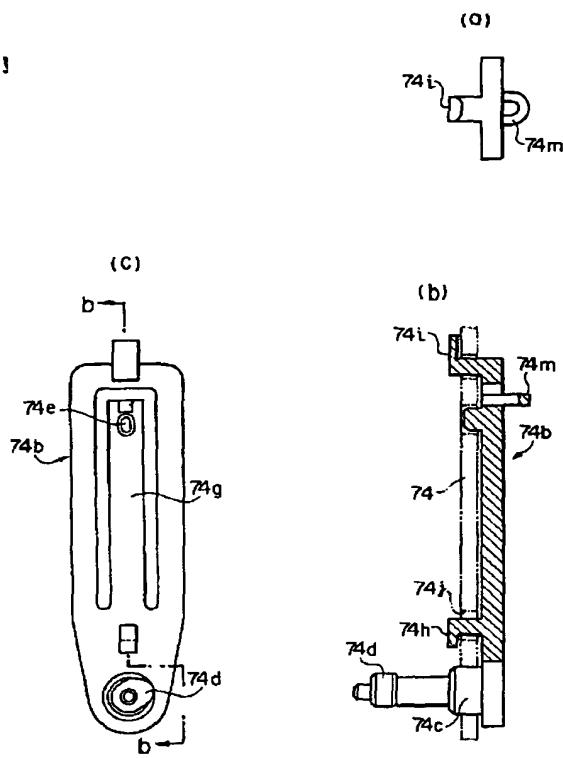
[Drawing 4]



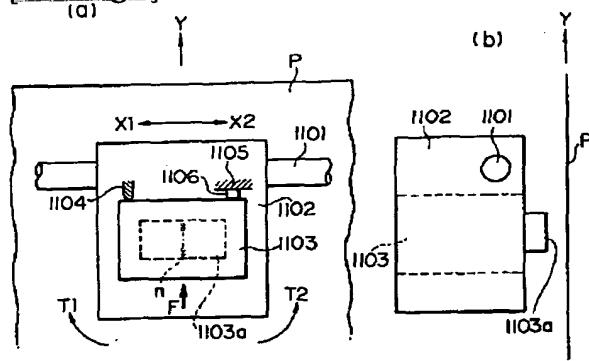
[Drawing 6]



[Drawing 7]



[Drawing 8]



[Translation done.]